An integrated control strategy to solve the disturbance decoupling problem for max-plus linear systems with applications to a high throughput screening system

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Résumé en anglais	This paper presents the new investigations on the disturbance decoupling problem (DDP) for the geometric control of max-plus linear systems. The classical DDP concept in the geometric control theory means that the controlled outputs will not be changed by any disturbances. In practical manufacturing systems, solving for the DDP would require further delays on the output parts than the existing delays caused by the system breakdown. The new proposed modified disturbance decoupling problem (MDDP) in this paper ensures that the controlled output signals will not be delayed more than the existing delays caused by the disturbances in order to achieve the just-in-time optimal control. Furthermore, this paper presents the integration of output feedback and open-loop control strategies to solve for the MDDP, as well as for the DDP. If these controls can only solve for the MDDP, but not for the DDP, an evaluation principle is established to compare the distance between two output signals generated by controls solving for the MDDP and DDP, respectively. This distance can be interpreted as the number of tokens or firings that are needed in order for the controls to solve for the DDP. Moreover, another alternative approach is finding a new disturbance mapping in order to guarantee the solvability of the DDP by the same optimal control for the MDDP. The main results of this paper are illustrated by using a timed event graph model of a high throughput screening system in drug discovery.
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